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The Cement Mill Edition of *Concrete*

The Cement Mill Edition of CONCRETE is edited exclusively for those interested in the manufacture of portland cement and related products.

Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition.

The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

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Audit Bureau of Circulations

CEMENT MILL SECTION of

Concrete

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NORMAN M. STINEMAN, *Editor*
J. C. WITT, *Consulting Editor*

NRA MEMBER U.S. WE DO OUR PART

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Vol. XLI
No. 9

Cement Mill Section of
Concrete

SEPTEMBER
1933

Grind Cement Clinker and Lime-Clay to Produce New Cements

Manufactured with Purpose of Overcoming Objections to Present-Day Portland Cements—Meet Demand for Variety of Cements for Specified Uses

NOTWITHSTANDING the fact that portland cements are manufactured to meet existing specifications, it is generally known that these cements are not adaptable to all of the uses to which they are put, and that a number of changes in the specification requirements are necessary for cements which are subjected to various specified uses.

Thus it is known that, while a portland cement may pass the existing specifications for portland cement by a wide, safe margin, it may, at the same time, result in concrete that is not durable, or in concrete which, due to its high heat of hardening and consequent volume change, results in cracking.

Of recent date a great deal of emphasis has been placed on the chemical composition of portland cement and the manufacturing procedure as practiced, and a new school of thought has as its object the limiting of certain of the compounds present in portland cement.

In a number of investigations carried out it has been found, in this connection, that the tricalcium silicate and tricalcium aluminate compounds, when present in excessive amounts in a cement, are responsible for the high heat of hardening of concrete with consequent volume changes that result in cracking. It has also been found that some cements containing high percentages of these compounds result in concrete that is not durable.

New York State Investigation

A comprehensive study made by Ira Paul of the engineering department of the New York State Department of Public Works* in connection with the use of portland cement for concrete roads, and covering the past twenty years, has revealed that a number of failures were due to the use of high-lime cements. From the data presented there is shown a steady increase in the lime content of five portland cements used during the period 1920-1930. In Table 1 the increase in the tricalcium silicate content of the cements in question, with the corresponding decrease in the dicalcium silicate content, is given.

*Engineering News-Record, Feb. 16, 1933, pages 212-213.

A second table shows the present condition of concrete roads constructed during the period 1914-1930, the condition being plotted against the compound composition of the portland cements used.

TABLE 1. TRICALCIUM AND DICALCIUM SILICATE CONTENT OF FIVE BRANDS PORTLAND CEMENT DURING PERIOD 1920-1930

Year	Per Cent of Tricalcium Silicate	Per Cent of Dicalcium Silicate
1920	35.18	34.60
1930	50.89	20.80

Perusal of results shown in Table 2 shows roads constructed with portland cements having the higher percentage of tricalcium silicate to be the least durable, while

TABLE 2. CONDITION OF ROADS BUILT IN PERIOD 1914-1930

Condition of Concrete Roads	Average Per Cent of Tricalcium Silicate in Cement Used	Average Per Cent of Dicalcium Silicate in Cements Used
Very Good	31.93	40.44
Fair	38.58	33.98
Poor	42.82	28.90
Disintegrating	47.03	23.29

those roads that were constructed with portland cements having the higher percentages of dicalcium silicate were the most durable and otherwise satisfactory.

Conclusions Drawn from New York Highway Investigation

Conclusions arrived at by Mr. Paul were as follows:

(1). High-lime portland cements such as are now produced are high in tricalcium silicate, a compound that is acknowledged to produce high early strength, but which is not conducive to durability.

(2). The tricalcium silicate compound exerts its greater influence in its early periods with increased strengths. However, the rate of strength increase tends to decrease with age so that eventually the high tricalcium silicate cements may be exceeded in strength by cements containing

a lower percentage of this compound and a correspondingly higher percentage of the dicalcium silicate compound.

(3). The dicalcium silicate compound is one of the most desirable constituents in cement, since it attains its strength at later periods and is conducive to durability in concrete.

(4). The greater the tricalcium silicate content in a cement the greater the total expansion and shrinkage in concrete.

(5). The tricalcium aluminate compound in cement has a certain detrimental effect on concrete, since it hydrates very rapidly and generates a considerable amount of heat.

(6). In general, the problem of increasing the life of concrete roads can be solved from the cement angle through the production of low-lime cements in which the tricalcium silicate compound is below 40 per cent, thus increasing the percentage of dicalcium silicate, which is a desirable compound known to give longer life and durability in concrete structures.

Study of Cement for Hoover Dam

Further in this vein, preliminary reports covering the investigation of cements for use in the Hoover Dam† have gone into the question of composition of portland cement and the relation of the various compounds to the heat of hydration of cement.

Table 3 shows the contribution of the major compounds in cement to the heat of hydration.

TABLE 3. CONTRIBUTION OF EACH PER CENT OF COMPOUND TO HEAT OF HYDRATION, CALORIES PER GRAM

Age, Days	Tricalcium Silicate	Dicalcium Silicate	Tricalcium Aluminate	Tetracalcium Alumino-Ferrite
7	1.1	0.2	2.4	0.0
28	1.2	0.4	2.3	0.1
90	1.2	0.6	2.2	0.1

Thus, when chemical composition is considered with relation to heat generation it is found that each compound contributes a definite share of the total heat of hydration, and that the total heat released by a unit of weight of any of the compounds is proportional to the rate at which the compound hydrates. Thus tricalcium aluminate, which hydrates to a large extent in a single day, releases the largest total amount of heat per unit weight of any of the compounds. Tricalcium silicate, which hydrates to a large extent within the first week, releases the next largest amount of heat per unit weight. Dicalcium silicate and tetracalcium alumino-ferrite, both of which hydrate slowly, release correspondingly small amounts of heat.

TABLE 4

Cement	Compound Composition, Per Cent				Heat of Hydration, Calories per gram of Cement			Mortar Compressive Strength, Mass Curing		
No.	C_3S	C_2S	C_3A	C_4AF	7 da.	28 da.	3 Mo.	7 da.	28 da.	3 Mo.
L-2	68	9	12	9	100	110	111	4320	5110	5130
L-1	55	23	11	8	86	99	104	4080	5070	5480
L-3	26	52	11	8	71	86	96	2150	4550	4770

†Cement Investigations for the Hoover Dam, by Raymond E. Davis, R. W. Carlson, G. E. Troxell and J. W. Kelly, *Journal* American Concrete Institute, June, 1933, pages 413-431.

Table 4 shows the effect of chemical composition upon heat of hydration and mortar compressive strength.

The cement compositions shown in Table 4 are typical of the extremely high-lime cements, the normal cements, and the high-silica portland cements manufactured today, and perusal of the strength data shows the extremely high-lime cement to have but 18 per cent increase in compressive strength between the 7 and 90-day periods; the normal cement shows a 34 per cent increase in strength between the 7 and 90-day periods, while the high-silica cement shows a 121 per cent increase in strength between the 7 and 90-day test periods.

Taking Cement No. L-1 as normal, we find the high-lime cement to have a heat of hydration of approximately 11 per cent greater, while the high-silica cement has a heat of hydration of around 13 per cent lower, than that of the so-called normal cement.

Tricalcium Silicate the Greatest Factor

While it is common to state that the high heat of hydration of cement is due in greater part to the tricalcium aluminate content, it is found on analyzing cements, as a whole, that the tricalcium silicate content is the greater factor in this connection, due to the greater percentage of this compound usually found in cements.

Thus, Table 5 analyzes these factors and gives a clearer picture of the effect of the compounds on the heat of hydration.

TABLE 5. CONTRIBUTION OF EACH COMPOUND TO TOTAL PERCENTAGE OF HEAT GENERATED IN SAMPLES L-1, L-2 AND L-3 AS SHOWN IN TABLE 4

Cement No. L-2 (High-Lime Portland)

Age, Days	C_3S	C_2S	C_3A	C_4AF
7	70.9%	1.7%	27.3%	0.0%
28	71.7	3.1	24.3	0.9
90	71.3	4.7	23.1	0.9

Cement No. L-1 (Normal-Lime Portland)

Age, Days	C_3S	C_2S	C_3A	C_4AF
7	66.1%	5.0%	28.9%	0.0%
28	65.2	9.1	24.9	0.8
90	62.9	13.2	23.1	0.8

Cement No. L-3 (High-Silica Portland)

Age, Days	C_3S	C_2S	C_3A	C_4AF
7	43.8%	15.9%	40.3%	0.0%
28	40.1	26.6	32.5	0.8
90	35.7	35.7	27.8	0.8

Thus it is seen that in high-lime portland cements the greater percentage of heat generated is due to the tricalcium silicate content, with the tricalcium aluminate content second and the dicalcium silicate content a poor third. In normal-lime content cements the tricalcium silicate content continues to be the chief reason for the heat generation, and in high-silica cements only does the heat generated by tricalcium aluminate and dicalcium silicate approach that of tricalcium silicate.

Some Conclusions on Heat of Hydration

Conclusions arrived at concerning the influence of the chemical compounds present in portland cement, upon the heat of hydration, may therefore be said to be as follows:

(1). Tricalcium aluminate (C_3A) liberates more heat per unit of weight than does any other major compound, and this liberation very largely occurs during the early stages of the hardening process. Thus, in a high-lime port-

land cement the C_3A content may be responsible for, roughly, 25 per cent of the total heat generated. In a normal portland cement the C_3A content may be responsible for 30 per cent of the heat generated, and in a high-silica portland cement the C_3A content may be responsible for 35 per cent of the heat generated.

(2). Tricalcium silicate (C_3S) liberates approximately one-half as much heat per unit of weight as does tricalcium aluminate during the hydration process, its heat being liberated during the secondary stage of hardening, which is usually within the first week after hardening begins. However, due to the fact that C_3S is present in large amounts in the normal and high-lime portland cements, the C_3S content is responsible for the greater amount of heat generated in cements of this nature. It is only in the high-silica or low-lime portland cements that the C_3S content, being lower, is found to be responsible for the generation of heat on more or less equal terms with the C_3A and the C_2S contents.

(3). Dicalcium silicate (C_2S) and tetracalcium alumino-ferrite (C_4AF) produce the least heat of hydration, the generation of heat by these compounds being slow and long-continued.

Thus, perusal of the two very interesting articles on (1) the durability of portland cements*, and (2) the heat of hardening of portland cements†, in which the two problems were studied and attacked from different points, lead, in the final conclusion, to the same viewpoint, as follows: (A) To obtain high early strength in portland cement it is necessary to maintain a maximum percentage of tricalcium silicate in the cement, this resulting in cements which, when used for concrete structural purposes, having a high heat of hardening on the one hand, and in concrete that may not be durable on the other hand. (B) To obtain a cement that has a good gain in strength at later ages it is necessary to displace tricalcium silicate to a certain extent with dicalcium silicate; and in so doing, early strength must be sacrificed. However, such a cement is conducive to low heat of hardening and durability of concrete.

Cement Manufacturer Left on Fence

This leaves the cement manufacturer on the fence, for in supplying consumers with high-early-strength cement he is giving them a cement that does not have a low heat of hardening, and one that may not be durable. To give them durability and low heat of hardening he must of necessity give them a cement that does not meet their requirements for high early strength.

In an editorial appearing on page 33 of the July issue of the *Cement Mill Edition* of CONCRETE, P. H. Bates is congratulated on his recent advocacy of new and numerous cements for specified uses; that is, six or seven special cements, including high-strength cements, plastic cements, cements having low heats of hardening, those having low volume changes, special masonry cements and the like, since there is no one cement manufactured to meet all of these requirements.

In the same issue of the *Cement Mill Edition* of CONCRETE, pages 27-30, there is described a new process for the manufacture of a variety of cements, whereby, under the same process with certain variations in the control and the materials utilized, it is possible to produce high-strength cements, cements equal to present portland cement, cements having low heat of hardening, cements having low volume changes, masonry cements, and so on.

The Process

Under the process in question caustic lime is passed through a hammermill and reduced through No. 4 mesh and discharged into a common elevator. Clay, in its moist, lump form is automatically proportioned and discharged into the elevator, the elevator in turn discharging the lime-clay mixture into the top section of a screw-type hydrator, at which point sufficient moisture is added in the form of a gauged amount of water to insure hydration of the lime and the proper reaction between the lime and silica of the clay. The material is agitated in the air-tight hydrator and conveyed over a distance of 125 ft., at which point it is discharged into the feed screw of the tube mill. At this same point preliminary ground portland cement clinker is automatically fed to the mill, the proportioning being as follows: 90 per cent portland cement clinker with 10 per cent of the lime-clay mixture (lime-clay mixture composed of 75 per cent lime and 25 per cent clay). These materials are finely ground in the tube mill under controlled moisture, temperature and fineness conditions, to the end that the moisture present in the product issuing from the mill does not exceed 5 per cent; the temperature of the products issuing from the mill are kept within the limits of 165 to 180 deg. C., the fineness of the products is kept above 98 per cent passing through the No. 200 mesh, which in the test in question corresponded to an 85 per cent fineness through the No. 325 mesh screen and in excess of 60 per cent of fines in an F. L. Smidth laboratory air-separator at a pressure of 28 mm. The cement was manufactured as a high-early-strength cement for comparison with a second high-early-strength portland cement produced at the end of the test, and data covering the two cements are shown in Table 6.

TABLE 6. COMPARISON BETWEEN TWO HIGH-EARLY-STRENGTH CEMENTS

Chemical Analyses	High-Early Strength Portland Cement	Processed High-Early-Strength Cement
SiO_2	22.08%	21.44
R_2O_3	8.20	8.42
CaO	65.40	62.27
Mgo	1.39	1.27
SO_3	2.26	2.07
Ign. Loss	1.04	4.40
Insol. Residue	0.22	6.12
Physical Tests		
Normal Const.	28%	31%
Initial Set	2:15	1:50
Final Set	4:50	4:05
Specific Grav.	3.14	2.97
Fineness—No. 200	98.0	99.5
Fineness—No. 325	85.5	86.3
Tensile Strength, 1:3 Sand at Age		
24 Hours	327	315
3 Days	393	405
7 Days	450	532
28 Days	562	637
3 Months	565	706
Heat of Hydration, Rise in Temperature of neat 6 by 6-in. cylinders embedded in diatomite	32°C.	16°C.

Curve No. 1 in the diagram shows the rise in temperature of the high-early-strength portland cement, while in Curve No. 2 is found the rise in temperature of the processed high-early-strength cement. The low heat of

hardening of the processed cement in comparison with the high heat of hardening of the high-early-strength portland cement, notwithstanding the fact that the same portland cement clinker was used in the manufacture of both cements, is clearly indicated.

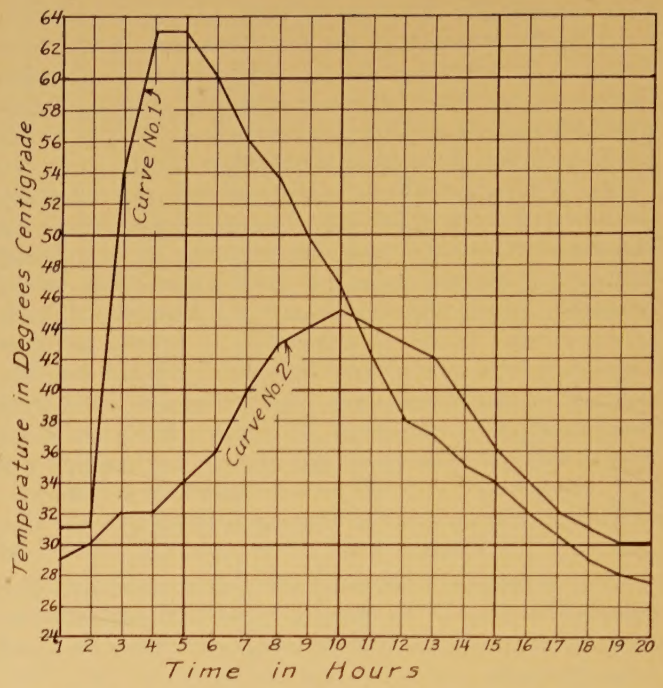
On the other hand, the gradual increase in strength of the processed cement up to and after the 28-day period, in comparison with the tapering off in the strength of the portland cement, as shown in Table 6, results in the former product meeting the durability requirements desired in high-early-strength cement, yet impossible to attain in portland cements as usually manufactured.

In the process indicated here, and mentioned in a previous issue of CONCRETE, cements, from so-called super cements down the scale to masonry, or the lower-grade cements, are all possible of manufacture, and only slight variation in the control features of the process and the materials used are necessary to make a cement for any desired use or specifications.

Control of Desirable Qualities Is Possible

It is not the intention at this time to go into the theoretical end of these cements, nor attempt to explain the compounds, known or new, that are formed in the hydration of lime at comparatively low temperatures in the presence of siliceous or argillaceous materials and grinding under controlled moisture, temperature and fineness conditions. Neither is it the intention to attempt an explanation of the catalytic effect of the portland cement clinker when it is ground with these new mixtures under the control features of the process previously indicated.

It is sufficient for the present to know that it is possible to manufacture a variety of cements for a variety of specifications and uses, and to know that such factors as the heat of hardening of the cements, together with their durability features, are easily controlled without altering in any way the other features desired in cements.



Processed high-early-strength cement develops much less heat of hardening than high-early-strength cement manufactured in the usual way

Arc Welded Crack in Rotary Kiln Holds After Three Years

Details of Procedure in Making Repairs—Get Access to Crack from Both Sides—Kiln Shut Down Only 16½ Hours

AN illustrated article on page 43 of the November (1932) *Cement Mill Edition* of CONCRETE describes the manner in which a broken kiln tire in the Olympic Portland Cement Company's plant at Bellingham, Wash., was repaired in place by the oxy-acetylene method. Obviously the cost of welding the tire in place was much less than the cost of replacing a broken tire.

Arc Welding of Crack in Kiln

Another application of welding to the repair problems encountered in a cement plant is described in a recent issue of *Welding News*. The article tells of the successful welding of a large crack in one of the sheets in the wall of a rotary kiln in a cement plant located in Kansas.

This kiln is about 10 ft. inside diameter made from 1½-in. plate and of riveted construction. It is over 125 ft. long, lined inside with fire brick about 6 in. thick, fired with pulverized coal under tremendous pressure, withstanding a heat of nearly 1,500 deg. F. at the stack located over 125 ft. from the firing nozzle. These operating conditions subject the steel cylinder to great strains even though supported every 30 ft. on large rollers.

A crack occurred almost in the center of one of the 1½-in. steel sheets and progressed around it at the rate of over an inch every day until it had become over 4 ft. long. In the meantime, the kiln remained in operation while the mechanical brains got together to figure out how to stop it. Patching would only weaken the sheet already strained, by the drilling of rivet holes, and in all probability would not stop the crack from continuing on past the patch.

Method of Procedure

Finally someone suggested arc welding and was promptly laughed at. However, the master mechanic decided to give the originator of the idea an opportunity to do his stuff. The kiln was stopped, the clinker pulled out and when the kiln was cool enough for a man to work

inside in an asbestos suit, the fire bricks were removed back of the crack. Sand blasting was convenient and was used to clean the outside of the sheet and thereby assist in locating the ends of the crack. Pilot holes ½ in. in diameter were drilled at the ends of the crack.

Torch Cuts Out Crack

The oxy-acetylene cutting torch was used to cut along the crack and make a 60-deg. "V" from one drill hole to the other. Again the surface of the cut was sand blasted and welding was started at the drill hole. Copper backing plates, which were clamped inside the kiln shell by C clamps, were used to eliminate arc blow and oxidation of the bottom beads of the metal. A low carbon bare rod conforming to the American Welding Society E No. 1B was used. The beads were laid longitudinally side by side for perhaps 2½ in. until a layer was formed, and then a No. 40 hammer was used to peen the weld. Another layer was laid from one side of the "V" to the other across the first layer and likewise peened, alternating from one end of the crack to the other until finished at the center. A light wash bead was run on the inside and peened flat.

Thirty minutes after the welding had been completed, the bricks were being replaced and within 16½ hr. total elapsed time the kiln was again in operation. The repaired kiln has been operating for more than three years without showing any signs of failure.

Early Cement Manufacture in Connecticut

In an illustrated paper recently read before the forty-ninth annual meeting of the Connecticut Society of Civil Engineers, Clarence N. Wiley, 258 Richmond Ave., West Haven, Connecticut, presents an excellent historical narrative of the early development of the natural cement industry in that state.

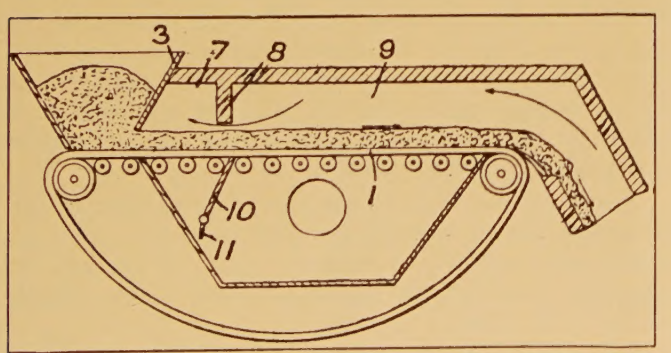
The author credits Connecticut with the distinction of being the second locality in the United States where natural cement rock was found and hydraulic lime was manufactured.

This paper has been published in the forty-ninth annual report of the Connecticut Society of Civil Engineers.

New Process Dries Raw Materials Prior to Calcination

AN arrangement for drying raw cement material prior to calcination on a traveling grid is described in the June (1933) issue of *Cement and Cement Manufacture* (London). The accompanying illustration shows the essential features.

The raw material is dried under such conditions that the material is not exposed to a calcining temperature during the drying treatment, and breaking up or bursting of



Drying raw materials before calcination on traveling grid

the granules is prevented. The drying may be effected by forcing through the material a mixture of exhaust gases from the rotary furnace mixed with cold air or with waste gases from the traveling grid. This is effected by providing a separating wall between the charging hopper and the calcining chamber, projecting downward and leaving a space at the bottom for the entry of a limited quantity of drying gases. A slide is provided to adjust the opening, and the suction draft is regulated by providing below the drying chamber a protection sheet and flap valve. In a modification the drying chamber is cut off from the calcining chamber. As shown, the granulated material from the hopper (3) is fed on to a traveling grid (1) on which it is first dried and then calcined. The drying chamber (7) is separated from the calcining chamber (9) by a wall (8) extending downward, leaving a space at the bottom for the passage of gases. To control the suction draft a protecting sheet (10) and throttle flap (11) are provided beneath the drying chamber.

The process described is covered by British patent No. 386,330, taken out by W. W. Triggs, 57 Lincoln's Inn Fields, London, England.

Offer Michigan State Cement Plant for Sale

Bids for the purchase of the Michigan state cement plant at Chelsea were invited early in August. All land, equipment, buildings, and sundry properties were included.

Most of the offers are reported to be based upon the junk value. An Ann Arbor, Mich., group, however, are said to be interested in the plant with the idea producing fertilizer and cement.

Chemical Exposition

More than 40 industries engaged in chemistry and chemical engineering will be represented at the Fourteenth Exposition of Chemical Industries, to be held December 4 to 9 at the Grand Central Palace, New York City.

An outstanding record in attendance and interest is anticipated, inasmuch as this is the first exposition in two years.

EDITORIAL

Progressive Modernization

ONE way to modernize a cement mill is to tear it down and build a new one.

In effect, that is about what several cement companies have done with their plants during the past few years. It is an expensive method, for it interrupts the continuity of operations and scatters the technical and operating personnel to the four winds. It probably means, also, that in anticipation of complete reconstruction, the plant management has made no important new installations for some years, so that manufacturing costs have been running high.

Progressive modernization is a far better policy to follow, for it has the effect of keeping the plant modernized from year to year. Such modernization can be accomplished during the normal winter shutdown, thereby avoiding the loss of personnel and the loss of markets involved in full reconstruction.

How progressive modernization operates in another industry was explained not long ago in an address by J. C. Knapp, vice-president of the Otis Elevator Company. It works the same way in the cement industry, for the principles involved are identical.

And, by way of corroboration, several cement companies have demonstrated the value of progressive modernization during the last two or three years. They are now in the extremely favorable position of being able to manufacture cement at a profit at present prices.

Companies that have continued to operate with old equipment may see their last opportunity to start progressive modernization during the coming winter. In the fact of rising costs their present equipment will operate under a terrific handicap.

More Uses for Coal Ash

AN editorial in the May issue, headed "Returning Coal Ash to the Mill Stream," called attention to an article in the same issue in which is described a process for treating recovered coal ash and utilizing it as an additional raw material.

In that process several valuable by-products are recovered before the remaining product—essentially a siliceous hydrate—is sent to the raw material bins.

Other worth-while uses for recovered coal ash may develop as a result of investigations conducted during several years by the Detroit Edison Company. Their study of the subject has arisen from the necessity of disposing of about 100 tons of stack dust daily.

The Detroit Edison Company investigators have considered the possibilities of coal ash as an admixture in concrete and cement mortar; but they have also tested the material, with considerable promise of success, as an inert and finely divided filler for various purposes. The more promising of these uses are as filler material in sheet asphalt pavement, sheet roofing, rubber, mechanics' soap, primer paint and putty. It has also some value as a fertilizer, as its chemical composition readily suggests.

Because of the numerous concrete admixtures already on the market, it is probable that the industrial uses just enumerated would provide the more attractive market for this waste product.

As pointed out in the previous editorial, cement plants that use pulverized coal as fuel produce this waste product in the kiln and in the power plant. If the cost of treating this coal ash for use as a raw material were to prove too great, the experience of the Detroit Edison Company may suggest several other means of disposal.

These possibilities, of course, are worth consideration only if the cement plant is already recovering its power plant and kiln dust as a means of abating the dust nuisance.

A Significant Letter

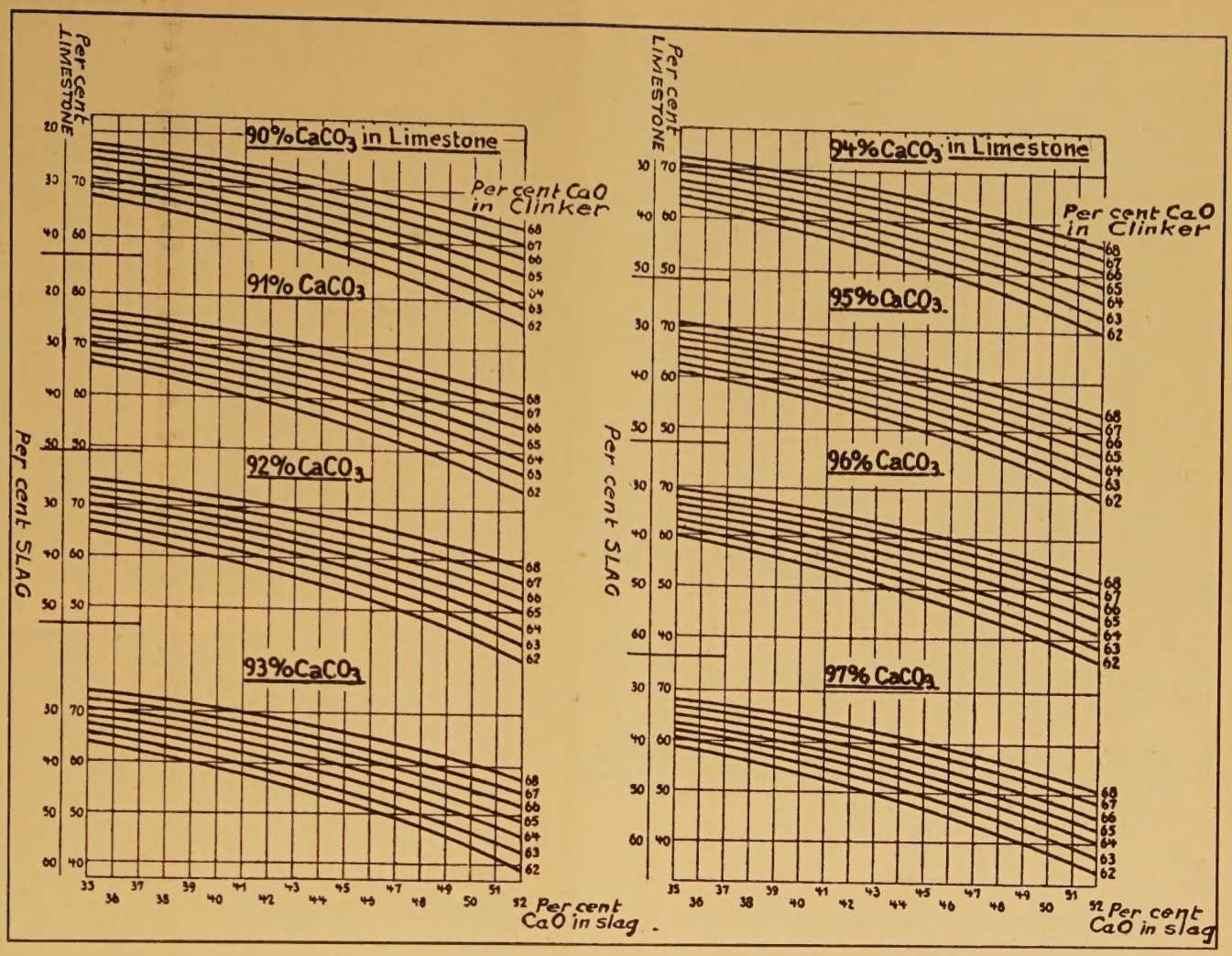
SHORTLY after the August issue of "Concrete" was mailed a letter was received from a large engineering and contracting concern of New York City.

"We would like to have a few extra copies of your August issue, containing a condensed version of the paper read by P. H. Bates before the American Society for Testing Materials," the letter read. "This is a wonderfully fine article, and we would like to send one copy to British East Africa, and several to some friends in this country."

Furthermore, this is only one of a number of letters received on this and related subjects—that all-important question of different types of cement for specified uses, which was the theme of Mr. Bates' A. S. T. M. paper.

Some engineers have long known and understood the situation set forth in the Bates paper; but their number was comparatively few and their voices were seldom heard. Now that the whole subject has been thrown wide open for discussion, through the A. S. T. M., these engineers are provided with a rallying point. Their number will increase and their voices will be much louder.

Only the manufacturer who is wilfully blind will disregard the signs of oncoming changes, or continue the futile attempt to uphold the myth that one cement can answer all service requirements.



Nomogram Aids Mixing of Raw Meal Where Composition Varies

A METHOD is described and a nomogram given by F. Wenzel in a recent number of *Zement*, whereby the proportions of the cement raw materials (in this example limestone and slag) can be read from a curve, given the $CaCO_3$ content of the dry limestone (c), the CaO content of the dry slag (b) and the CaO content required in the clinker (i.e., the CaO content of the ignited raw meal, designated a). The nomogram is built up from the equations—

$$x + y = 100$$

$$x = \frac{100(a - b)}{c\left(\frac{z}{100} + \frac{ua}{10{,}000}\right) - b}$$

where a, b and c have the meanings stated, x = percentage of limestone, and y = percentage of slag in the raw mix, z = molecular weight of CaO, and u = molecular weight of CO_2.

As an example, let $c = 95$, $b = 48$ and $a = 68$ per cent. Working with the curves for 95 per cent $CaCO_3$, take the curve for 68 per cent CaO in clinker (marked on the right of the diagram). Intersect this with the ordinate at 48 per cent CaO in slag (marked on base of diagram), and for the point so obtained read the proportions on the left of the diagram; the values obtained are limestone 59.5 and slag 40.5 per cent.

The nomogram is useful where the raw materials vary in composition. The examples shown range from 86 to 97 per cent $CaCO_3$ in limestone, 62 to 68 per cent CaO in clinker, and 35 to 52 per cent CaO in slag. The curves may be extended for use with other raw materials.

From *Cement and Cement Manufacture* (London), June, 1933.

Nebraska Shipments Show Increase of 113 Per Cent

Shipments of portland cement into Nebraska during the six months ended June 30 increased 113 per cent over shipments in the same period last year, the Department of Commerce reports.

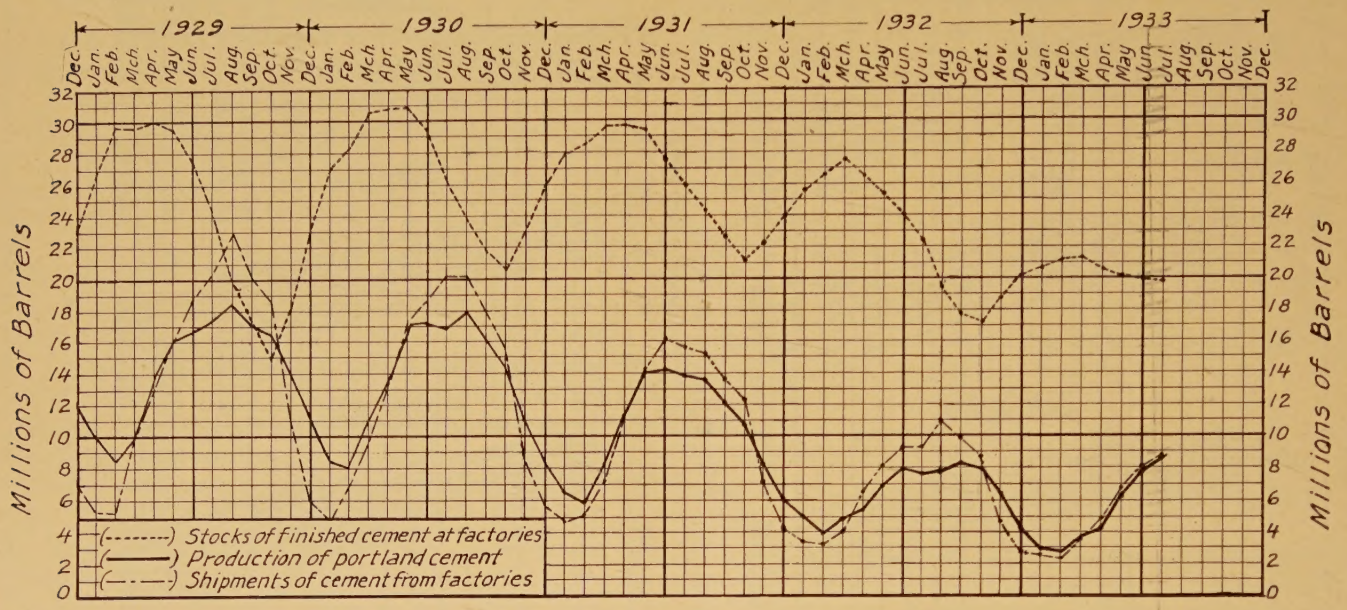
Cement Statistics for July

Relation of Production to Capacity (Per Cent)

	The Month	Twelve Months
July, 1933	37.6	26.3
July, 1932	33.4	34.2
June, 1933	35.2	26.0
May, 1933	27.4	26.0
April, 1933	18.9	26.2

Production, Shipments and Stocks of Finished Portland Cement (Barrels)

	1932	1933
Production, July	7,659,000	8,609,000
Shipments, July	9,218,000	8,697,000
Stocks at end of month	22,512,000	19,848,000
Production for year to date	41,815,000	36,277,000
Shipments for year to date	43,522,000	36,624,000



Witt Becomes Consulting Editor of "Concrete"

J. C. Witt, Chemical Engineer and Director of Research for the Universal Atlas Cement Company, has been appointed Consulting Editor of "Concrete."

An announcement and portrait will be found in the Construction Section of this issue.

PERSONALS

Morris Fortuin, general manager of the northern division of the Pennsylvania-Dixie Cement Corp., who had been seriously ill for eight months, died at his summer home near Nazareth, Pa., on Tuesday evening, August 22.

Mr. Fortuin was a native of Holland, coming to this country at the age of 6 years, and was educated largely in New York schools.

He began his career in the cement field with the Rosendale natural cement industry in New York City; he later joined the Pennsylvania Cement Co., when it was organized in 1898, rising from the position of salesman to that of vice-president and general manager. In 1926, when his company became part of the Pennsylvania-Dixie Cement Corp., Mr. Fortuin was appointed to the position he held at the time of his death.

Surviving are his wife, Mrs. Bertedna Fortuin; a daughter, Catherine Fortuin, and son, Roslyn Fortuin, at Nazareth; another son, David Fortuin, of Ithaca, N. Y., and also two brothers and three sisters in other localities.

Albert Moyer was elected president of the Vulcanite Portland Cement Co., New York, at a board meeting held August 17. Mr. Moyer was formerly sales manager and succeeds the late W. D. Lober.

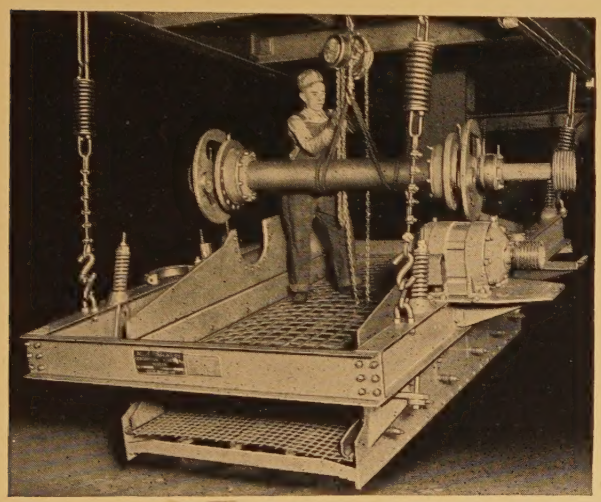
H. S. Sparks has been named manager of the El Paso, Texas, plant of the Southwestern Portland Cement Co., filling the vacancy created by the death of H. E. Nichols recently.

Mr. Sparks has been connected with the plant since 1924. He was promoted to assistant manager five years ago.

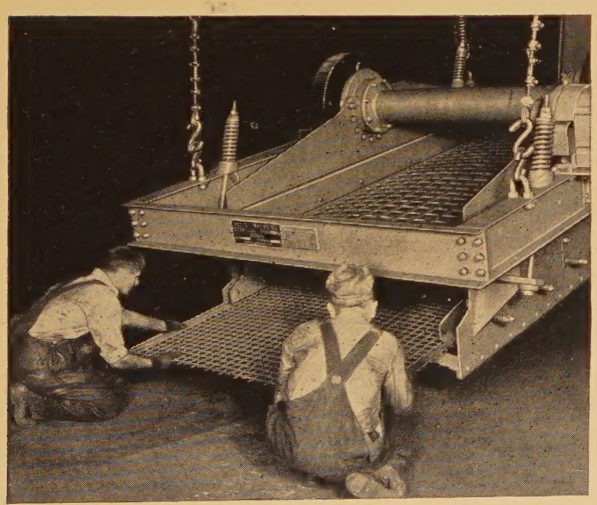
Marshall Beck, secretary and treasurer of the Great Lakes Portland Cement Corp., was burned to death at his home at Buffalo, New York, on July 28. According to reports he fell asleep in bed while smoking.

Because of the fact that correspondence from the United States continues to be addressed to him, announcement is made that Charles Spackman, of Clitheroe, England, died on March 11 last year. He was joint author of "Calcareous Cements: their Nature, Manufacture and Uses," and author of "Some Writers on Lime and Cement," two books well known in this country.

Mr. Spackman had devoted nearly the whole of his long life to the investigation of slag cements, shales, limestones and clays and their use in the manufacture of cement; and, during the war, calcined magnesite for the manufacture of refractories for lining steel furnaces, work which had not previously been done in England. He also helped the Department of Agriculture and Technical Instruction in Ireland in its endeavors to establish the cement industry in that country.



Driving Mechanism is convenient for inspection and is easily removed or replaced



Screen Sections are easily and quickly changed. Liberal clearance between decks facilitates spouting

With New Style B Vibrating Screens

Style B screens are of heavy construction with positive eccentric motion. They are especially suitable for heavy loads and are built in a large range of sizes. . . . The driving mechanism is above the screen convenient for inspection and lubrication. It can be easily removed or replaced. The screen body floats on balance springs reducing power requirements and the load on the bearings. The liberal clearance between decks facilitates spouting, inspection of cloth and changing of screen sections. Screen cloth is held in tension and is reversible. All bearings are of the anti-friction type enclosed in dust-proof housings. All revolving parts are enclosed, protecting workmen and reducing installation expense necessary to meet safety laws. Mechanisms can be rotated in either direction. Screen motor and drive, all built by Allis-Chalmers, are tested as a unit at the factory before shipment. . . . The above features result in a screen of high capacity, uniform product, and low power and maintenance costs.

OTHER ALLIS-CHALMERS PRODUCTS

Gyratory Crushers
McCully and Newhouse
Non-Choking Concaves
Jaw and Roll Crushers
Revolving Screens
Vibrating Screens
Scrubbers and Washers
Elevators and Conveyors
Feeders and Bin Gates
Friction and Electric Hoists
Grinding Machinery
Cement Mill Machinery
Mining Machinery
Electric Motors
Gearmotor Units
Texrope V-Belt Drives
Centrifugal Pumps
Air Compressors
Track-type Tractors
Road Machinery
Track-type Wagons
Tunnel Shovels

ALLIS-CHALMERS

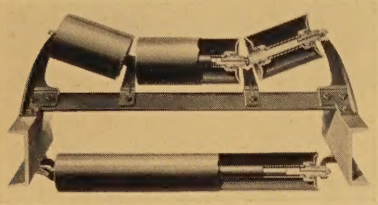
Allis-Chalmers Manufacturing Company, Milwaukee

Mill Equipment

Reliance Idler Improvements Are Announced

Strength, wearing quality and performance are factors that have been improved upon in the recent further revelopment of its Reliance idler, the Jeffrey Manufacturing Co., Columbus, Ohio, announces. A descriptive bulletin, No. 569, is available.

The outer shells of the rolls are made of high quality steel tubing, with full thick-



ness of wall throughout their entire length. They are readily lifted from the stands or hangers.

Oversize Timken tapered roller bearings of the self-aligning type are used, mounted on specially selected cold rolled steel axle shafts.

The sturdy one-piece malleable iron stands, which are secured rigidly to the steel base, are carefully die straightened to assure proper alignment and snugness of fit of the roll. Very wide feet are cast integral with the end stands.

●

Two New Burners Brought Out by B & W

The Babcock & Wilcox Co., New York City, announces that it has developed a combination pulverized-coal and oil burner which is said to meet the requirements of such an installation in water-cooled furnace walls.

It is the standard B & W multiple intertube burner. The oil burner is of the twin-nozzle type. It is inserted between two tubes in front of the pulverized-coal burner, extending back and through the burner casing.

Another new product is a burner adapted to combination firing through refractory burner-walls and ideally suited to small and moderate size industrial boiler units.

The burner is of the horizontal turbulent type and combines the features of the firm's circular burner and mechanical atomizing oil burner.

●

Improved Goodyear V-Belts for Multi-V-Drive

A new and improved type of Goodyear Emerald Cord V-Belt is being announced by Worthington Pump and Machinery Corp., Harrison, N. J., in connection with the Worthington Multi-V-Drive. Goodyear belts have been standard on this drive since its introduction.

High-power capacity, long flexing life, uniform cross-section and low stretch are the primary factors considered in designing the new belt. A basic feature is a greater concentration, about the neutral axis of the belt, of the load-carrying capacity. Nos. 0, 1 and 2 sizes have one endless cord in one plane, and Nos. 3 and 4 sizes have two endless cords in two planes. All cords are completely embedded in rubber, thus affording full insulation for the control of internal heat.

The tension and compression sections of the belt are composed of rubber, with layers of fabric distributed through the compression section to prevent excessive flexibility.

Linde Products Improves Welding Flux

New welding accessories brought out by the Linde Air Products Co., New York City, are an all-purpose aluminum welding flux and welding spectacles and lens.

The new flux is intended to replace the two fluxes previously marketed, one for welding pure aluminum and the other for welding aluminum alloys.

In the new type Oxweld No. 15 spectacle, the lenses are mounted in a natural canvas-bakelite frame and are 50 mm. in diameter. The bows are covered with insulating material, and the frame is nonflammable and does not conduct heat.

The Type AA lens, flat-ground and polished, is made in light, medium and dark green shades. It is said to have high protective qualities and to meet rigid specifications for eye protection.

Industrial Literature

Vibrating Screen Bulletin

Style B centrifugal vibrating screens are covered in *Bulletin* 1475, issued recently by the *Allis-Chalmers Co.*, Milwaukee, Wis.

Numerous views are shown, and a general dimension drawing and table are given.

The unit is said to be adaptable for heavy loads and the maximum range of sizes. Three principal parts—frame, body and vibrating mechanism—comprise its construction.

●

Boiler Feed

How the Copes double control regulator feeds the boiler according to the rate of steam flow, with correction for water level changes, is shown in a new booklet published by the *Northern Equipment Co.*, Erie, Pa.

This is booklet No. 133, an 8-page publication containing among other illustrations a schematic operating diagram in three colors.

●

Splash and Dripproof Drives

A 4-page leaflet, *Leaflet* 20584, describing a new, complete line of splash and dripproof motors and control for every machine requirement has recently been issued by the *Westinghouse Electric and Manufacturing Co.* This complete line of equipment is said to be especially suited to the requirements of machines where splashing occurs.

Copies of this publication describing the construction and distinctive features of these drives may be obtained from the company's nearest district office or direct from the advertising department, East Pittsburgh, Pa.

Field Activities

Combustion Engineering Reorganized

As of August 1, *Combustion Engineering Company, Inc.*, a newly organized company, took over the properties of *International Combustion Engineering Corp.* and affiliated companies recently sold by order of the federal court. The properties acquired include those of Combustion Engineering Corporation, Hedges-Walsh-Weidner Company, Coshocton Iron Company and Raymond Bros. Impact Pulverizer Company. In order to assure the best possible service to the company's customers, these properties will be operated under a single centralized management.

The officers of the new organization are: *Frederic A. Schaff*, president; *Joseph V. Santry*, executive vice-president; *Robert M. Gates*, vice-president in charge of sales; *Martens H. Isenberg*, vice-president in charge of production; *John Van Brunt*, vice-president in charge of engineering; *Harold H. Berry*, treasurer; *George W. Grove*, secretary and assistant treasurer; *George D. Ellis*, comptroller.